Hood Canal Regional Knotweed Control Strategy

Cover Photo: Knotweed population in the estuary of the Big Quilcene River, Jefferson County, threatens the function of the estuarine and riparian area. (HCCC).

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HOOD CANAL REGIONAL KNOTWEED CONTROL STRATEGY

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Executive Summary

The Hood Canal Regional Knotweed Control Strategy (HCRKCS) goal is to outline a consensus strategy agreed to by all the partners working to control the spread of knotweed in the Hood Canal region. This strategy will enable us to inventory, treat and assess our progress towards eradication and control of Knotweed as efficiently and effectively as possible. This effort also serves to document the seriousness of the threat knotweed poses to the ecological function of our aquatic ecosystems as well as the salmon that rely on those ecosystems. Our objectives are to:

- Move riparian areas toward a later seral stage by planting native conifers , shrub and hardwood species other than alder, where appropriate,
- Expand the quantity, and improve the quality of riparian buffers
- Communicate with our partners effectively,
- Establish common protocols and priorities for the required inventory, treatment, and assessment methodologies,
- Create a program that will allow us to adaptively manage our efforts, and
- Streamline funding and permitting for these efforts where appropriate

The partners involved in this Strategy are the Hood Canal Coordinating Council, U.S. Fish and Wildlife Service-Quilcene National Fish Hatchery, Jefferson, Mason, Kitsap and Clallam County Noxious Weed Control Board(s), Kitsap and Mason Conservation Districts, Hood Canal Salmon Enhancement Group, Skokomish Tribe, Port Gamble S'KlallamTribe, Washington Dept. Of Fish and Wildlife, and the 10,000 Years Institute. Many of these groups also participate in the Olympic Knotweed Working Group (OKWG). We also hope to include other governments, organizations, and community groups as this effort grows.

Introduction

In the Pacific Northwest, and especially in Hood Canal, the replacement of native vegetation by the non-native, invasive Knotweeds(s) *Polygonum spp.* poses a serious threat to riaparian and aquatic ecosystem function. This species has been identified in every county and nearly every major watershed in the Hood Canal Region. Knotweed has been shown to affect hydrological river function, fish and wildlife habitat, impede the development and successional trajectory of riparian (streamside) forests, recruitment of in-stream woody debris, streambank stability, nutrient cycling and food production. Knotweed is an aggressive colonizer that displaces native plants and animals historically associated with waterways including lakes, rivers, wetlands, and riparian forests. Knotweed colonization decreases biodiversity and disrupts the food chain by eliminating native plants and associated insects, thereby reducing food and habitat structure necessary for species that depend on riparian areas.

Riparian degradation has been identified as a significant limiting factor for Summer Chum in the Summer Chum Salmon Recovery Plan (SCSRP) Table 6.1, in the Chinook Salmon and Bull Trout Recovery Plans, and in the WRIA 16 and 17 Management Plans. While knotweed is not specifically identified in the recovery and management plans, this invasive species, if left untreated, will reduce riparian tree establishment and could have detrimental and long lasting effects on the successional trajectory of riparian forests, bank stability, hydrology, nutrient loading, woody debris, habitat structure, micro-habitat conditions and aquatic biota of adjacent lotic systems (Urgenson, 2006). One of the objectives of the HCRKCS is to move riparian forests to a later seral stage by controlling knotweed and the planting of native conifers, shrubs and hardwoods other than alder, where appropriate, is highly desirable.

In 2005 the Washington State Department of Agriculture wrote the Washington State Integrated Knotweed Management Plan (WSIKMP) and started to provide $500,000 statewide in funding to combat knotweed. Very limited funding from other sources has been available across the state. As the ecological consequences of knotweed on riparian habitat is becoming clearer through research, more funding and effort must be devoted to the control of knotweed in order for our riparian areas to continue to support resilient aquatic ecosystems.

Knotweed Characteristics & Ecological threat

Knotweeds, Japanese Knotweed (Polygonum cuspidatum ~ Fallopia japonica), Giant Knotweed (P. sachalinense ~ F. sachalinensis), Bohemian Knotweed (P. bohemicum ~ F. x bohemica) and Himalayan Knotweed (P. polystachum ~ Persicaria wallichii) are listed as Class-B noxious weeds on Washington State's Noxious Weed List, are perennials that can grow from seeds, rhizomes or stem pieces. In Washington State, it colonizes both upland and riparian areas. Common names are elephant ear bamboo, Mexican bamboo, and fleeceflower. The plants exhibit hollow (untrue for the Himalayan variety), upright, bamboo-like stems growing to 1-5 meters. Knotweeds exhibit a variety of leaf shapes

that differ by variety, from an elongate triangle to heart shaped. The stems are often reddish or red speckled. Though it may die back to the ground after a hard frost, the stems may persist through the winter as bare, reddish brown stalks.

The species has evolved a number of characteristics that allow it to exploit areas with low soil nutrients, such as river corridors and roadsides. The most problematic knotweed characteristic in the invasion of riparian areas is the range of reproductive mechanisms that the plant exhibits. Fragments of knotweed roots (rhizomes) and stems are able to form new plants, and are transported to new locations through flooding and bank erosion to colonize still more areas. Any part of a knotweed plant weighing greater than 5g is capable of producing a new plant via vegetative reproduction (McHugh 2006, Soll 2004). If the plants are cut back it is important to dispose of the crown and stems properly. Once stems are thoroughly dried they are unable to regenerate.

Knotweeds have an extraordinary ability to spread vegetatively from crown, stem and rhizome (underground root). Even tiny amounts of cut stem, crown or rhizome are capable of producing a new plant. Controlling spread is therefore dependent on preventing the spread of stem, crown or rhizome.

Rhizomes grow rapidly underground and are responsible for the spread of the plant on site. They produce long white shoots at the apices of the rhizome which send up shoots to the surface.

If the rhizome is cut it will produce a shoot. Digging or other disturbance is known to increase stem density. If soil contaminated with rhizome is moved to another part of the site or to another site it will regrow and cause spread.

Knotweed emerges early in the growing season and grows quickly, shading out lesser species with its large leaves. Many species of mature shrubs are shaded out by the taller knotweed and even some tree species, such as alder, exhibit smaller populations in heavily infested areas. Knotweed species have long been thought of as sterile, but this has come into question in recent years. Bohemian knotweed, the hybrid species, produces viable seeds that will quicken the spread along riparian areas via seed dispersal in the water column.

Recent research (Urgenson 2006) has shown that Knotweed invasion in Western Washington riparian areas has:

1. Direct and indirect mechanisms by which knotweed invasion can alter the nutrient cycling and productivity of riparian forests and adjacent aquatic food webs.

2. A negative correlation between knotweed invasion and the species richness and abundance of native understory herbs, shrubs, and juvenile trees.

It is more than likely then that if there is a reduction in riparian tree establishment, that knotweed is negatively impacting the recruitment of large woody debris (LWD) into the stream. Lack of large woody debris has also been identified in the SCSRP as a significant limiting factor in nearly every watershed. Knotweed is also resetting the successional trajectory of riparian areas to an earlier seral stage by

impinging on juvenile tree production. One of the goals in the SCSRP is for riparian areas to be expanded through planting wider and higher quality buffers; this cannot be done without controlling the knotweed that infests these riparian areas. Studies have shown that knotweed degrades the ability of a riparian area to function properly (Urgenson, 2006), the SCSRP identifies impaired riparian areas as a significant limiting factor to recovery, and therefore controlling this plant is a high priority for summer chum salmon recovery, as well as other listed and non-listed salmonids. The Mid-Hood Canal Chinook Recovery Strategy: 10-year Objectives and 3-year Plan does specifically identify exotic species control and states that this action will help ensure proper development of late-stage riparian forests for long-term function. The references in the adopted Salmon Recovery Plans and three year work plans, attest to the high level of importance of controlling knotweed and restoring natural riparian function.

Since, by their very nature, riparian areas are at risk of disturbance through natural ecosystem functions such as flooding, and the continual changes in stream channels. The mechanisms of disturbance are reason why the riparian areas also have a high biodiversity value in terms of succession habitats. Riparian habitats in turn influence the terrestrial and aquatic species that utilize these areas. These factors support the reason for knotweed and other invasive plant control especially in the freshwater riparian corridor. For the purposes of this plan we are including the estuary areas of the rivers since knotweed has been shown to be salt water tolerant in local watersheds such as the Big Quilcene.

Watershed contributions associated with riparian areas also factor into quality of the marine waters. The nitrogen-fixing qualities of alder trees have been implicated in the oxygen draw-down in lower Hood Canal. Landscape changes away from more mature forest and established riparian areas may play an important role in reducing the seasonal levels of dissolved oxygen, especially in lower Hood Canal. Controlling knotweed and restoring riparian areas to a later seral state may be a corrective action and have positive impact in the long term to the low dissolved oxygen problem in lower Hood Canal.

Knotweed inhabits upland, terrestrial environments as well as riparian areas. Since there is not sufficient funding to completely eradicate this plant from all the systems it occupies, prioritization must take place for which areas are the most important to begin control efforts.

Prioritization of Treatment Areas

The priority areas for the Hood Canal Knotweed Regional Control Strategy are listed from most important to less important as follows:

1. Riparian Areas along Stream and River Courses (including estuaries)
2. Marine Shoreline Riparian Areas
3. Upland Sites
    a. High Dispersal Potential (Roads, Ditches) and visibility
    b. Low Dispersal Potential and visibility

1. Riparian Areas along Stream and River Courses (including estuaries/mouths of streams)

A riparian area is defined as the vegetated area adjacent to any water body (fresh, salt, flowing, and/or standing waters), that constitutes the interface between upland terrestrial and aquatic ecosystems, and that exhibits some influence on that water body either now or in the near future.

Given the effect of knotweed infestations is much greater on natural habitat-forming processes, structures, and functions is much greater in flowing, freshwater habitats than other aquatic ecosystems, we've concluded that our priority treatment area should be riparian areas along stream and river courses. We have defined this particular riparian area as the channel migration zone with the riparian buffer (documented through relevant regulatory process), the flood prone width, as determined by NRCS methods (identified by electronic field office technical guide), or the site potential tree height (NRCS soil survey) of the predominate soil, whichever is greater. Generally then the widths for which we will seek knotweed control are up to about 200' from the ordinary high water mark or the Channel Migration Zone (CMZ) whichever is greater but vary widely and can extend beyond 200' on some cases, especially in large alluvial river valleys with wide channel migration zones.

There is recognition that 200'+ of inventory and treatment area on each side of the water course is a large area and thus initial efforts may seek to phase in control at a smaller width first. For example on a small to medium size river that is not prone to frequent evulsions, a survey of 50' from ordinary high water may be sufficient for an initial assessment and first round of treatment. In subsequent years as more of the knotweed is controlled expanding survey areas beyond the initial 50' is recommended to insure that the entire CMZ is surveyed for knotweed. In larger river systems that have frequent evulsions and are more prone to larger scale flooding events, it is recommend to survey a larger area as these systems can spread knotweed further out than smaller systems. Partners must determine their initial assessment widths based on the above factors while also accounting for factors such as time and funding.

The priority watersheds for this strategy reflect the same watersheds indentified in the SCSRP, Chinook Salmon and Bull Trout Recovery Plans, and the 3 Year Work Plan Implementation Schedule for these salmon recovery plans. These plans have already clearly defined action areas and habitat assessments based upon those ESA listed species, and provide some certainty as to our efforts. Given these species' critical status recognized by local, state, tribal, and federal governments, this Strategy will adhere to these priorities. We expect that this list of priority watersheds will evolve over time. However, we also support the idea that there will be other efforts undertaken in other watersheds utilizing funding sources other than salmon recovery. When partners are applying for Salmon Recovery funds to improve riparian condition by controlling knotweed, the priorities according to the aforementioned, adopted recovery plans, will be utilized. When the control efforts are aimed at other goals, these priority watersheds need not be used. The watersheds are classified into three tiers and are not ranked within the tiers.

- 1st Tier Priority Watersheds for Action (Extant Summer Chum Populations)
    - Dosewallips River
    - Duckabush River
    - Hamma Hamma River
    - Skokomish River
    - Big & Little Quilcene Rivers
    - Snow & Salmon Creeks
    - Lilliwaup Creek
    - Union River
    - JimmyComeLately Creek
- 2nd Tier Priority Watersheds for Action (Re-Introduced Populations)
    - Chimacum Creek
    - Tahuya River
    - Big Beef Creek
- 3rd Tier Priority Watersheds for Action (Extinct Populations and/or Recently Observed Individuals)
    - Little Anderson Creek
    - Seabeck Creek
    - Stavis Creek
    - Big Anderson Creek
    - Dewatto Creek
    - Finch Creek
    - Little Lilliwaup Creek
    - Fulton Creek
- 4th Tier Priority Watersheds for Action
    - Other fish bearing watersheds

Relative prioritization of tiered watersheds for control

In order to determine an implementation schedule, once assessment surveys have been completed in patterns can calculate relative rankings by watershed. This is done by looking at the percentage of the watershed that is infested. For example if a partner has done assessment surveys on three watersheds, one has knotweed only at the mouth, the other has some on the lower one mile of stream, and the third has an infestation between river miles six and eight, the one with the infestation highest up in the watershed would be the highest priority. This is due to the fact that the river that has an infestation at river mile six has a very high spread potential to the lower six miles. So even if the number of infested acres is lower, the fact that it has potential to spread and infect more acres than the river that only has knotweed on the lower mile, this makes that river system with a higher potential to spread and infect new acres a higher priority to get treated. Partners who are responsible for control schedules for knotweed should work with this logic in order to rank their own priority watersheds relative to each other for control work.

2. Marine Shoreline Riparian Areas

Marine riparian areas are defined as the vegetated areas adjacent to any body of saltwater that exerts influence on that body of saltwater. As these systems are not subject to yearly flooding there is less risk of naturally-forced spreading than in freshwater riparian areas. Though these systems are important to salmon for a variety of functions, their effect on natural habitat forming processes such as LWD recruitment does not have as large of a subsequent effect on the development and maintenance of the marine nearshore ecosystem. However, because shorelines have high biodiversity value and knotweed impairs this diversity, and because of the value of shorelines to humans and wildlife, these areas are designated as the second priority for the HCRKCS

- 1st Tier Priority Marine Shoreline
    - Shorelines within one mile of the mouths of 1st, 2nd, and 3rd tier priority watersheds
- 2nd Tier Priority Marine Shoreline
    - All other marine shorelines

3. Upland Sites

These are defined as upland vegetated sites outside of the riparian corridors described above. The first priority within these areas is those that have a high potential for further spread; these can be but are not limited to roads and ditches. Other areas that have high priority are those that are highly visible to the public such as parks or in other areas.

Rapid response

During the control season should partners become aware of new patches of knotweed, a brief assessment of that patch can be conducted to determine if a rapid response would be effective to eliminate the small patch. Some of the criteria that should be used to determine if a rapid response is appropriate are

- Is the new patch in an area that is prone to spread rapidly?
- Is there easy access to the site?
- Can the patch be treated with minimal (a day or two) interruption to the already determined control schedule?
- Is the new area close in proximity to where the crew is already working?

The rapid response provision provides the flexibility to partners to go treat a small patch to prevent it from becoming a big patch in areas where it fits the above criteria. A rapid response however should not impinge on the partner's ability to complete control work of previously determined priority areas.

Assessment Surveys & Assessment-Treatment Surveys

Assessment Surveys

These are surveys where GPS points are collected using the data dictionary to document where knotweed is located in the watershed. This data can then be displayed on a GIS map, which is further expanded in the mapping section. The uppermost extant of the knotweed in the watershed is a critical point to be found, as treatment downstream of this point without treating the upper extent is futile for long term control.

Assessment surveys and Assessment/Treatment surveys should be conducted on foot in riparian areas and a GPS unit. The most accurate GPS unit available should be used, preference is given to resource grade units that are capable of 2-3M resolution. Recreational units such as Garmin are not preferred due to the very high level of inaccuracy of the readings given, as high as 25m in some cases. The user should also be able to utilize the data dictionary in order to create data points where the knotweed is located. The data from the surveys are downloaded to ArcGIS. Maps can be used to have treatment crews to pinpoint exactly where the knotweed infestations are located. Parcel and landowner information could be extracted and mapping can also allow comparison between sites over different years to assess treatment effects. In addition, crews should carry paper maps and field data sheets to record locations and the appropriate information on knotweed patches when satellites are not available, batteries go out or other malfunctions prevent the collection of electronic data.

The goals of the assessment surveys are to:

1. Record the locations of knotweed sites and the number and size of plants present, so that crews are able to subsequently find and treat the plants and monitor treatment success. This is crucial in planning where to start treatment and for other planning purposes such as landowner identification and communication.

2. Provide baseline data for monitoring and effectiveness efforts by providing hard data on the extent and distribution of knotweed in a specific area.

3. Determine where the upstream extent of the infestation occurs. Since knotweed is spread by seasonal flooding, the upstream source must first be determined since successful eradication of knotweed on a watershed level depends upon the treatment proceeding from upstream to downstream. Without the cooperation of upstream landowners, treating infestations downstream has limited efficacy, as the sites downstream of untreated sites will most likely be re-infected by untreated sites upstream.

Assessment/Treatment Surveys

This method combines collecting GPS data and control treatment. The advantage to this method is that field crews do not have to travel to a site a second time for treatment as is inherent in the method outlined above. The disadvantage is that this methodology may not allow full communication and coordination with the affected landowner before treatment is implemented. It also does not allow for planning how much time and materials will be needed to do the treatment effectively.

Mapping

Pre-assessment mapping is critical for determining the extent of knotweed, physical surveys to be conducted, communicating with landowners, and developing assessment travel logistics. Following assessment and inventory, display of knotweed distribution and extent data using GIS software such as ESRI ArcGIS Desktop is an easy way to arrange, visualize and store data. GIS can be used to overlay photos, parcel ownership, LiDAR and many other layers of information. GIS maps are crucial in showing the extent of infestation to landowners before treatment and will identify the upstream source of knotweed infestation. Maps are a very powerful tool to show extent, progress and successes of knotweed control efforts. Partners should use best available equipment and technology to create these maps, including resource grade GPS units (such as a Trimble GeoExplorer III/GeoXT or better), and GIS software along with aerial photos, stream layers and parcel data. GPS data and pictures should be collected each time a site is visited and control work done. This is done for monitoring purposes in order to determine efficacy of control efforts.

GPS and Data Dictionary

Using devices that have at least 1-3 meter accuracy and the ability to transfer and display this information into ArcMap or ArcExplorer is vital to creating effective maps that can be used by field crews and shown in grant applications and reporting. **Data should be collected in NAD_1983_StatePlane_Washington_South, however if data is collected in a different projection, this should be noted when submitting data to the HCCC.** All GPS & GIS data should be submitted to the HCCC in the interim until permanent storage location will be determined. This could be with WSDA mapping program or within the Habitat Work Schedule, but a long term repository for the data sets has yet to be determined.

Ideally GPS units should have ArcPad capacity and be able to upload parcels and aerial photosets. The units should also be able to upload a custom data dictionary. In order to collect data in a consistent manner across the region, agencies should download and use the Knotweed Data Dictionary or ArcPad Quick forms that have the same attributes of the data dictionary listed below. This data dictionary was developed by the OKWG and has been modified for use by this group as well. Two data dictionaries have subsequently been developed based on the one provided by the OKWG, the basic and the advanced. To facilitate data collection, both data dictionaries where set up with drop-down menus which minimized the amount of typing needed, in addition many gps units can have an auto-fill feature that will help further in ease on data entry.

The advanced dictionary is virtually identical to the OKWG and asks for more information about the sites than the basic. Data collected with the advanced dictionary is:

Agency Name, Collector, GIS Projection Reference, Site ID, Species of Knotweed, Cluster Type, Average Stem Height, Stem Count, Phenology, Site Type, Action, Herbicide, Surfactant, Treatment, Ownership, Canopy, Substrate, Plant Erosion Potential, Site Erosion Potential, Area, Unit, Comments, Date, and Time.

The Simple data dictionary has been pared down to very basic information and includes the following:

Agency Name, Collector Name, Site ID, Species, Cluster type, Avg. Height, Stem Count, Area size of patch in square feet), Action taken and comments

More detailed instructions on using the advanced and simple data dictionary are found in Appendix 1.

All partners should be using at least the simple data dictionary so that data taken in different places by different people can be grouped, summarized and mapped. This allows for easy sharing of data and the ability to conduct monitoring on control efforts.

Photos

Digital photos should be taken of each site that a GPS point is taken at. These photos should also be Geo-Tagged using Google Earth, Flickr or a similar program. A digital photo is geotagged when location data (latitude and longitude coordinates) are added to the digital file alongside the photo's existing EXIF data. EXIF is the data in a digital photo file that describes things like the kind of digital camera used to take the photo, the date and time when the photo was taken and the conditions under which the photo was taken (including shutter speed, aperture, etc.). Geotagging allows photos to be related spatially to the exact place it was taken. This is important for displaying the data as well as part of the monitoring protocol.

Shapefiles of the points taken in GIS can be exported and displayed in Google Earth and using Picasa you can geotag your photos. Some cameras can automatically geotag photos and some GPS units can take photos that are geotagged. This is a very simple process and is the best way to document and spatially relate photographic data. It also provides a foundation and a powerful visual tool to use later in

workshop presentations showing movement of knotweed and how effective treatment is. These are also used as a component of monitoring for project success.

Knotweed Control Methods

Preventing spread

It is important that an effective knotweed management program is established including, where possible, herbicide treatment. Otherwise the plant will inevitably spread. Treatment of colonies on riverbanks should be treated as soon as possible because bank erosion can lead to plant material breaking off and dispersing downstream.

If pulling or cutting is the only option allowed, plant pieces should be treated as hazardous waste, kept on site, and allowed to dry out thoroughly after they have been pulled or cut. This can process can be helped by putting the material onto a plastic sheet, or raised wooden platform, rather than on the ground. Regular checks should be made to ensure that this material is stable with no potential for contaminating watercourses or other sites, or developing roots. Thoroughly burning plant material on site after cutting and drying, where current laws allow, can be an effective means of disposal provided that the waste is burnt on site and not removed to other land. **Pulling or cutting should** is not usually very effective and requires considerable effort and oversight, and should be avoided and other control methods used whenever possible.

Ensure that machinery, tools and work clothes are free of fragments of knotweed before leaving the site. Tracked vehicles, off-road tires, tools and even work boots can harbour fragments of knotweed and could potentially cause spread to another site.

Chemical Treatment

The use of herbicides is the most effective option for the control of knotweed. Herbicide treatment may take three or more years to completely kill the entire plant. An Integrated Pest Management Plan has been developed by the WSDA and is adopted by the HCRKCS. The specific guidelines are found in the Freshwater Emergent Noxious and Quarantine Listed Weeds Integrated Pest Management Plan that was developed in 2004 by the WSDA for the Washington State Department of Ecology (DOE). It is available for download at the DOE website. The IPM Knotweed Profile updated (November 2007) lists the specific control techniques for knotweed that are being adopted by this HCRKCS and can be found in Appendix B. It may be necessary for partners who are using this plan to receive funding or permitting assistance to adopt the IPM. Adopting the IPM by partners using this plan should be evaluated on a case by case basis and each partner must determine through their own processes whether or not they need or desire to adopt the IPM.

Foliar Application

Dense stands of Japanese Knotweed can be treated with a foliar application of glyphosate or Imazaypyr herbicides. These herbicides are absorbed through growing leaves and stems where it is translocated throughout the plant and root network.

If the knotweed is sparsely distributed, use a 2,4-D amine, which is specific to broadleaved plants and will not harm the grasses.

More targeted methods of applying herbicides are being developed for sites where it is important to protect the native flora. This includes using a weed wiper to apply the herbicide directly to the leaves of the plant rather than spraying or injecting herbicide directly into the plant. This ensures that only target plants are treated.

The plants should be treated between April and September when they are in the growing phase. Plants can take up to 6 weeks to show signs of die-back.

For environmentally sensitive habitats and those near water, we recommend using Glyphosate* 2,4-D, Amine*, and/or Imazapyr*.
Note: Not all herbicides containing these active ingredients are suitable for use in or near water. Use of herbicides in or near water requires NPDES permit and an aquatic applicators license. For an expanded discussion of these requirements, refer to the permits section of the HCRKCS. All riparian area applications will require the agency carrying out control efforts to obtain the NPDES permit and comply with all the terms and conditions required by the aquatic applicators license.

Stem-Injection

Injecting the stems of knotweed can be carried out with either the use of the knotweed injection gun or by using a syringe to inject each stem that is greater than 0.5 inch diameter. The advantage of these devices is that plants that are too tall to spray easily may be treated by injecting herbicide directly into the hollow stems. Injection methods also reduce injury to desirable vegetation. Injection is also thought to lead to more immediate death of knotweed plants. Injection is more costly and labor intensive than foliar spray application. It also requires greater quantities of herbicide than foliar spray application, as each stem must be treated separately. Supplemental herbicide labels that give specific instructions for stem injection using the glyphosate formulations Rodeo®, Aquamaster®, and Glypro® are available from the manufacturers. As with all treatments described, monitoring and reapplication will be necessary until the root system is exhausted.

Note: Injections may be very time consuming for large infestations and you will quickly approach the maximum label rate per acre. A genral rule of thumb is if you have more than 2000 stems per acre you will not be able to treat the site with the stem injection method.Using a foliar application the first few years can reduce the stand to a size that is reasonable to inject. As the stand has become sufficiently reduced, stem injection becomes a more attractive method.

Pour Applications

After cutting the stem about 2 inches above the ground (between the lowest nodes), carefully pour ~5ml of undiluted herbicide into the stem cavity. Different herbicides allow various concentrations of solution to be applied by this method. You must read and follow the herbicide labels. A follow-up treatment and monitoring will be needed to control new seedlings and resprouts.

This method is viable, but has greater chance of spilling herbicide than the injection method and plant material must be effectively disposed of.

Non-Chemical Treatment: Cutting, Mowing or Pulling

Regular pulling will, after a number of years, eventually exhaust the rhizome and kill the plant. This is only an effective method of control if it is carried out continually over a number of years and is only effective on small or newly established stands. It is not recommended for areas that are unstable and therefore vulnerable to spreading the plant while trying to pull it over the next four years. Cutting and mowing can be used to prevent seed spread, to reduce vigour and to reduce underground biomass and may be useful to use before applying herbicide but not as the sole control method.

Note: With all these methods the main problem is the safe disposal of the cut or pulled stems to prevent spread.

Cutting - can be carried out with loppers, cutters, hooks, scythes, or bladed mechanical cutters. Do not use cutting equipment near a watercourse (even ditches) as fragments of knotweed could enter the water and spread downstream. All cut material should be collected up, then dried out and burnt on site or removed and taken to a landfill, as described above.

Note: Burning of fresh growing material has little effect on the plant. Ensure workers clean equipment before leaving the site and to avoid leaving fragments of knotweed spread around the site.

Studies have shown that with four cuts a year can reduce the plant's vigour and underground biomass. The first cut should be carried out when the first shoots appear and the last cut should be done in late summer but before it dies back in the autumn (September/October). Annual cutting will be required for multiple years.

Cutting can also be used to reduce plant height before chemical treatment. Allow a re-growth of 2-3 ft before spraying to be effective.

Regular mowing is a way of reducing the vertical growth of knotweed, but may encourage the spread of rhizomes and new infestations from shoot fragments. Mowing may visually reduce your infestation but if mowing is stopped then the plant can take over the site again. Avoid using a flail mower as this may result in small, viable fragments of stem regenerating in neighbouring, non-infested areas. It is preferable to use a mower with a collecting box for Knotweed areas. Clippings should be gathered up

and left on site and checked frequently for re-growth. Mowing is NOT recommended as a control method and other methods should be used.

Pulling as a method of eradication is only useful when treating small or new infestations where only a few stems have established in upland conditions. It should never be used in riparian areas where migration may occur. It is a good method to use on sites with native or sensitive species, if you have patience and persistence. Stems should be pulled or dug regularly when the plants reach full height. They should be pulled near the base to include some rhizome. Control of a small infestation could be achieved in 3 years but this method requires persistent, sustained treatment to work.
You must ensure that pulled stems are disposed of correctly (in the trash or dried and burned as described as below) to avoid further spread.

Smothering

Sites of knotweed may be covered with a heavy duty geo-textile fabric or black plastic after the stems have been cut down or before they grow back in the spring. This method works on small patches with open terrain that is stable. The material must cover a minimum of 7 feet beyond the outside of the population. The material must be overlapped and loosely placed. It may also be beneficial to periodically stomp on the area to break any new growth. The site must be frequently monitored and checked for holes in the plastic and you must remove any debris from the area. This method can be combined with cutting and must be monitored and maintained for a minimum of 5 years. This method can be effective on small areas but is very labor intensive, very expensive to purchase the material and requires vigilance to monitor the site to insure the fabric is not compromised.

Grazing

Cattle, sheep, horses, donkeys and goats can graze knotweed. Animals prefer the young knotweed shoots as they emerge in the spring but will still feed on woody stems. Grazing may reduce shoot densities and height but will not eradicate knotweed. Dead stems should be cut back in winter as these can deter grazing in the spring. Continued grazing will ensure the supply of new shoots throughout the growing season.

Grazing is not an eradication tool but can be helpful in suppressing the plant and reducing its overall spread.

Biological Control

There is hope for the introduction of insects or fungi from the original native areas of knotweed that could help manage the plant but this control method would have to undergo extensive trials and will not be available for some years. Currently research is underway to identify a suitable biological control agent. This project is a joint project between WSU and OSU and is being conducted at a secure lab in Oregon, although further funding is needed.

Note: Digging of established knotweed stands will lead to a significant increase in stem density. The cut rhizome is capable of regenerating; even small fragments are capable of producing a new plant.

Public Education and Outreach

As stated in the Washington State Integrated Knotweed Management Plan (WSIKMP), participating agencies will conduct a public notification campaign before treatments start each spring or prior to inventory. The campaign will consist of several components. First, the participating agencies will send a mass mailing consisting of informational letters and fact sheets to all streamside residents of areas to be treated. Landowners can be identified using GIS tools by overlaying stream layers with parcel layers and generating a list. Many different mailers have been developed by agencies and those are available by contacting the HCCC. These may be modified to suit each agencies taste and purpose. See Appendix C for examples. These brochures should be sent to those landowners that have been identified as having knotweed on their property based on the assessment.

Permission to enter private property should be obtained before conducting assessment. If partners are using WSDA funds for herbicide, then Landowners must give written permission before any treatments are applied on public or private property. This will require an additional mailing or personal interaction. Typical templates of consent forms are also available through the HCCC, these where developed by the Clallam Noxious Weed Control board see Appendix D. Communication with these landowners is crucial to the success of knotweed control and to subsequent riparian enhancement efforts.

Also, participating agencies will post public notices and notify adjacent owners where treatments will take place. The notices will be posted at any public access point within one half mile of any treatment site. Public access points are listed in the Public Boating Facilities in Washington State Second Edition - 1988, published by the Washington State Parks and Recreation Commission Boating Safety Program. Partners should also carefully read posting requirements from the NPDES and insure they are in compliance with those requirements as well.

Workshops may also be conducted at neighborhood community centers to ensure the public is receiving valid information and to allay concerns by landowners. Having landowners that you have worked with and those that are known in the neighborhood, are important as they can advocate for you to their friends and neighbors. Using before/after pics of sites in workshop presentations to show movement of the plant and the efficacy of treatment is also important. These workshops should also cover the basics of invasive species, stream and riparian ecology, water quality issues and salmon habitat. Workshops provide a great forum to educate the public not only about knotweed, but about other ecological issues surrounding their streams. Every effort should be made to convey the importance of riparian health and how controlling knotweed is an important practice that can enhance their riparian buffers. Also messaging themes such as stewardship and ownership to the landowners should also be stressed.

Revegetation

One of the goals of this control strategy is to restore proper riparian function by taking actions that will move riparian areas to a later seral stage. Another critical component in accomplishing this beyond just controlling knotweed is to re-establish native vegetation in the riparian areas as soon as possible where treatment has taken place. In areas dominated by early seral species such as alder, the goal would be to

plant confers to expedite the trajectory toward a later seral stage. This should be pursued as an outreach opportunity to landowners on the importance of riparian buffers on habitat and water quality.

Landowner permission must also be obtained in order to plant additional vegetation. Landowners should be educated in the importance of riparian vegetation and all efforts made to gain permission to conduct plantings, and to request their support in nurturing these plantings to success.

Evaluating each site for existing vegetation is crucial. In cases where there is heavy native over story, and sufficient conifers, replanting may not be necessary. WSDA monitoring studies concluded that sites that did have heavy native plant overstory, native plants quickly re-colonized the site. However, in plots that did not contain heavy native plant cover, other invasive species moved into the site after the knotweed was controlled. Research from the 10,000 Years Institute on the Hoh River and work conducted by the OKWG in Clallam and Jefferson Counties, also confirmed this hypothesis.

Sites that are lacking in native plants, especially conifers, in general should be planted after the second round of knotweed treatment, where possible. While sites are highly diverse and should be treated on a case by case bias, there are some general guidelines that can be recommended for reestablishing riparian vegetation.

A planting plan specifying the species and quantities of plants to be replanted, timing of planting, and extent of maintenance should be developed for each reach or treatment site. Preference is given to reestablishing conifers since they will contribute important factors such as year round shade and durable large woody debris. Other species should be planted where appropriate to increase plant diversity and/or canopy density or where landowners may be unwilling to plant trees. Species chosen should be based on best available data such as soil surveys, species characteristics, plant availably from growers, and site specific conditions to maximize plant survival and restore function to the impacted riparian areas.

Vegetation should be replanted as soon as possible following treatment. If the infestation is very large, it may be best to treat for two seasons then attempt to replant. For example, the first treatment of an area takes place one summer, with subsequent treatment taking place the following summer. Following the second summer of treatment the knotweed is generally knocked back enough to allow for the planting of desirable species when needed. (Lucero, pers. Communication) The third summer re-treatment of knotweed can usually take place by injection or wiping posing little risk to newly planted native plants.

Permitting

Activities to conduct knotweed control, especially in riparian areas require permits and licensed applicators. Federal and state permits may also required as well as written permission from the landowner on whose property the work is being done on.

WSDA State Pesticide Applicator License with Aquatic Certification

If the applicator is considered a public entity (tribe, noxious weed control board) then one can obtain a Public Operator licenses from the State. An aquatic certification is also required to obtain and use herbicide near water. If the entity is public then the entity is required to be self-insured.

If the entity is Private then Commercial applicator license with an aquatic certification is required and the private entity also has to carry liability insurance for the application of the herbicides.

There are multiple requirements from the state to keep a license, such as continuing education credits, recertifications, and herbicide application record requirements. Partners should consult with the WSDA for license requirements.-

National Pollutant Discharge Elimination System (NPDES) permit

In order to use herbicides in a riparian area to control knotweed a NPDES permit IS required.

As stated in the Integrated Pest Management Plan for Freshwater Emergent Noxious and Quarantine Listed Weeds:

National Pollutant Discharge Elimination System (NPDES) permit Washington State Department of Agriculture holds a National Pollutant Discharge Elimination System (NPDES) permit issued by the Washington Department of Ecology under authority of the federal Clean Water Act for treating noxious and quarantine weeds growing in or near water with herbicides. This action was in response to a determination by the Ninth Circuit Court of Appeals that the application of an herbicide in compliance with the labeling requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) did not exempt an irrigation district from obtaining an NPDES Permit to control aquatic vegetation. WSDA provides coverage under this permit at no cost to agencies and individuals who wish to control noxious and quarantine listed weeds in or near water in compliance with terms of the permit. As required in the permit, WSDA and Ecology have developed monitoring plans and Integrated Pest Management (IPM) plans for these types of applications.

The purpose of this IPM plan is to offer advice to contractors/cooperators that seek to treat noxious emergent freshwater weeds under Agriculture's Noxious Weed NPDES permit. The permit calls for each cooperator/contactor to adopt this IPM plan when treating noxious emergent freshwater weeds. This plan offers clarifying information about the IPM approach and about specific practices appropriate to noxious weeds found in wetlands, lakeshores, riparian zones, ponds, and ditches (IPM, 2007).

A licensed public entity applicator can apply to WSDA for a National Pollution Discharge Elimination Systems (NPDES). This process is conducted online and requires the entity to provide information on where the application will be applied, weeds treated, and herbicides used. It also requires the entity to adopt the Integrated Pest Management Plan for Freshwater Emergent Noxious and Quarantine Listed Weeds.

After receiving the application, WSDA will send the applicant a notification, this is signed and returned to WSDA by the entity, and then they issue the actual permit. This permit takes 4-6 weeks to complete the processing. These permits are only good for one season and are only for noxious weeds on rivers NOT lakes.

At the end of the year you must report on the quantities of actual herbicides used by watershed to satisfy both license and NPDES requirements. Pesticide Records must be submitted when you report.

If you are not a public entity (Tribe or Weed Control Board) then you must apply to DOE directly for a NPDES permit. This can also be done on line

http://www.ecy.wa.gov/programs/wq/pesticides/final_pesticide_permits/noxious/noxious_index.html

The requirements are similar to the WSDA process. It is recommended to work with the noxious weed control board and if possible get the NPDES through the WSDA. This is to help reduce permitting requirements but also to help foster coordination among different groups.

Section 7 Endangered Species Act (ESA) Consultation

This requirement comes into play if there is a federal 'nexus'. In other words, are Federal funds being used to implement the project? If the answer is yes, then consultation with USFW and NMFS will be required. If you are receiving federal dollars for any part of knowteed control, whether it's materials or for wages, they answer is yes, federal funds are involved in my project. If there is a Federal Nexus and consultation has to take place, a request for a biological opinion (BO) must be submitted. This should take place six months prior to the project beginning to give sufficient time to complete the requested paper work and for USFW and NMFS to issue a BO.

If the project is funded through SRFB as a Riparian Habitat Restoration project, it is therefore an activity that is a recovery action for Salmon and Section Seven ESA consultation then consists of completing the Limit 8 Self-Certification of Proposed Habitat Restoration Activity form.

Monitoring and Effectiveness

Having good baseline data from the assessment phase of our programs is vital to having an efficacious monitoring program. At a minimum, participating agencies should utilize GPS units with the data dictionary to document knotweed sites along with height and stem counts. Collecting this data can show trends and effectiveness of control efforts. More scientifically rigorous monitoring can be performed using methodology established by Dr. Tim Miller, WSU weed scientist, or other more rigorous protocols.

Sites should not only be monitored for level of knotweed control but also what types of species are recolonizing these sites as well as surrounding conditions such as canopy cover.

The basic components of the Monitoring efforts are:

- Conduct Assessment or Assesement/Treatment surveys
    - Contact landowners and get permission to conduct surveys
    - Use HCRKCS data dictionary to collect gps data on infected areas

    - take and geotag digital photos
    - input to GIS and shapefiles
    - submit electronic data to HCCC or WSDA as central database
- Implement Control efforts
    - Conform to herbicide use reporting requirements dictated by WSDA
- Go back annually to conduct subsequent inventories and follow up treatments
    - Take New GPS points
    - New Photos
    - Record what types of vegetation are re-colonizing the site
- Retreat/Replant if needed
- Create annual reports on efficacy and extent of efforts, lessons learned
- Participate in Knotweed control group meetings to share data and lessons learned

As we implement and learn and make progress we will come back together to adaptively manage this document and our approach.

Funding Strategy

There are a variety of options for how this partnership goes about implementing a regional strategy to control knotweed. A loose confederation approach might only require that we agree on the priorities and protocols within the Strategy. A stronger confederation may require not only agreeing on these priorities and protocols but also on sharing resources, coordinated monitoring and reporting, and an adaptive management process.

The current recommendation is that we start with the basics of common priorities and protocols, especially within the planning framework for salmon recovery in Hood Canal, but begin to seek out the funding resources needed to create a more coordinated process in that we believe we believe we will be more effective in controlling knotweed across the region this way. In the past partners have been left on their own to pursue funding for knotweed control. This has led so some great work being done in Hood Canal. It could be however, there may be more success in collaborating for funding. Advantages in moving in this direction include programmatic permitting such as ESA consultation through the Salmon Recovery Funding Board's Limit 8 Exception and NPDES permitting. Another advantage is an umbrella program would most likely have more success in obtaining funding and keeping a variety of sub-programs functioning with consistent funding and matching funds. We'll also be able to show progress

much easier than trying to incorporate our independent results further down the road.Funding opportunities to pursue for various partners include:

- State Funding
    - WSDA Knotweed Control Program $512,280 available statewide in 2007-09
    - Salmon Recovery Funding Board
    - Puget Sound Acquisition and Restoration
    - Washington Department of Ecology Centennial Clean Water
    - Washington Department of Natural Resources
- Federal Funding
    - US Fish and Wildlife
    - NOAA restoration stimulus fund
    - US Forest Service
    - Bureau of Indian Affairs
    - Natural Resource Conservation Service
- Private Funding
    - National Fish and Wildlife Foundation, including Community Salmon Fund

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This material and the data dictionary was developed and provided by members of the OKWG. It has been modified and there are now two data dictionaries the Advanced and Simple. The fields with an * are those for the Advanced data base only, the fields in bold face type are for the Simple database.

Data is most consistent and sites most easily compared when collected by a single individual over an entire project, over multiple seasons. However, that may not always be possible, even on a single project, and certainly not likely for multiple projects. Therefore it is useful to collectively agree on what information to collect, and how to define each field. One of the most problematic questions that remains is, "What constitutes a site?" Is it based on a certain size, distance between target plant, changes in landownership, or purpose of data collection? (For example, the answer may differ depending on whether the site is being defined for inventory or treatment purposes).

It is designed to help a collector know what to enter into each field. A "field" name will eventually become a column header in a database. Each entry under a field, will become one "cell" in that "field". The entries in all the fields will become a row, and together will form one record in the data base.

Most fields in this data dictionary have drop down menus to avoid "typing" on GPS units and to speed data entry. While this standardizes and eliminates spelling or other errors, it can limit what a collector can enter in any given field. It is impossible to anticipate every potential need in the field, so use the comment field when the dropdown menu doesn't have what you are looking for or there is a need to note something unusual. Comments are great to tell exactly where to find a plant, or the way to the site. If you find you are having enter the same piece of information, add it to the drop down menu. DO NOT change the order of the fields, or how a field is spelled, as this will invalidate the ability to collate data from many projects without considerable additional effort.

If you are using ArcPad open up an existing knotweed shapefile with the attributes listed below (contact Luke Cherney, HCCC is you don't have one), import the attrbutte table, then say yes to set up as quick form.

*-Indicates advanced data dictionary entry only

Bold text is required for basic and Advanced Data Dictionary

Agency Name-typing in full name is best, abbreviation is OK. Set to autofill if possible. This is particularly necessary to identify the data's source and where it may be stored.

Collector-type in first and last name, or ALL initials-This is critical to identifying who collected the data originally.

Site ID-We have not agreed on how to create truly unique markers, but consider adding LB or RB to distinguish between left and right bank. Knowing left or right bank may be very important for access and would help clarify positions on small streams or on those days when it is hard to get a good reading.

E.G. surveying the Big Quilcene the first site would be BQLB1, BQRB1. Second site is BQLB2 etc. The datat dictionary is set to autonumber this. When you go to type in it will autofill to BQLB3 if the last site you did was 2. This is especially helpful as it is didfuclt to remember the number you are one when there is some distance between them.

Species-Distinguishing between species can be very difficult. Generally, list Bohemian, by default, if it is not obviously Japanese, or Giant. Himalayan is the easiest to distinguish from the other species. List as best you can. Unknown can be used for other species you wish to record-in that case, type species information in the comment field.

Cluster type- Record individual, if it appears that the site has mostly single canes. Record cluster, if it appears that most of the site is established clumps, that may be separated from each other, but not yet a monoculture. Record group, if it is a solid patch, with little to no space between clumps. Record fragment if it is a piece of plant, such as a root or cane, that has obviously dislodged from another plant and newly rooted. On a highly infested system, there may not be enough time to record fragment information.

Average height- Most sites have a mix of heights. Record what seems to be average height of plants in the whole site.

Stem count-Choose the range that includes the number of canes. There were far more categories but they have been further lumped to help with the mapping and assessment process. Choose from the following 7 categories: 1, 2-50, 50-100, 101-200, 201-500, 500-1000, >1000.

Area- Enter in estimated square feet (length times width) the size of the patch you are calling a site. This allows for a infested acres and treated acres to be calculated later on.

Action-Indicate whether this visit is strictly inventory or includes treatment (in that case choose treatment). This is the end of fields to be filled in for inventory. The remainder of an inventory record will default to none. If the site is treated, continue to fill the remaining fields. This is also the last of required fields. All the rest are optional.

Unit-Indicate which unit of measurement is being used for the area. Eg, feet, acres, etc.

Comments-Enter comments as desired. ***This field has been expanded to 50 charactors as there is some difficulty with software if it is extended beyond 50.***

*-Datum-This is information about how spatial information is being collected by a GPS (Global Positioning System) unit. It is vital to know exactly which system is being used to correctly place data points in a GIS (Geographic Information System) for any given user.

- List the datum, (ellipsoid/projection, and coordinate system) eg. NAD27 or NAD83, UTMs or State Plane, and which zone so that we know what to convert from when we share the data between us. It should be set to autofill.

- NAD27 is an older ellipsoid based on an arbitrary point in Kansas, and was used prior to international convention, which has moved to NAD83, based on the center of the earth's mass.

*Phenology-Indicates what stage of lifecycle, but is the AVERAGE state of the site. –Record pre-bloom before flowering is evident, record bloom, while flowers are seen, record post-bloom when most plants look like they have finished blooming.

*Site Type-This is another confusing field to record. Riparian/gravel bar is the default setting. Choose the category that best suits the whole site. Don't split a site based on this field.

- Riparian – Gravelbar- Includes areas within the river channel and just on the bank.
- Riparian – Veg Highwater-Includes the level where most vegetation begins, or bank full width. Plants will be mainly on the bank.
- Riparian – Floodplain-Includes areas where water *has* reached, or generally reaches during floods. Often there will be a flattened, possibly raised area, where vegetation is growing. This type of site can extend back into the woods. The floodplain will not always be obvious so it may be difficult to know where an area may have flooded in the distant past. Do the best you can.
- Riparian – Other-This category can be used where nothing else seems to fit, it might include an old channel that you want to specifically call out or may merely be a wooded site that is near the water, but doesn't really fit previous categories.Large Woody Debris-Use to indicate that most plants are found or obviously first established on, or were trapped by river debris, either in the channel, or to the side.
- Field/Pasture-Use for site that is an open, grassy area or is used as a pasture.
- Roadside-Includes sites that are next to roadways, trails, paths or in parking lots (or just at the end), includes ditches. If it is also RIGHT along a stream, may want to use riparian-other. Tracking this designation might help us note knotweed spread or persistence as a result of mechanical maintenance practices.
- Developed-Includes sites for non-crop landuses-residential or commercial.
- Forest-Use for sites not near water, but in forested area.

*Herbicide-Defaults to none. Choose the product you are using. If not listed, choose other, and add the product to the comment field.

*Surfactant-Choose none for injection, or choose the product you are using from the list. If not listed, choose other and note surfactant in the comment field.

*Treatment type-Defaults to none. Choose from treatment type as appropriate. *Make sure to choose inject and foliar, if a site received both treatments at the time of filling out the record.* (Is this how it was filled out by everyone?)

*Ownership-Type in the owner's name if you know it. (Type in private or public land, if that is all you know). Leave blank if it is unknown to you.

*Substrate-This is an optional field. Choose the type of ground that best describes your general site. Most likely it will be a mix of several of the possible categories. Select cobble for areas that are mostly rocks. Select gravel for areas with marble sized rocks (or slightly smaller), but not sandy. Select sand for areas with few rocks, but still gritty soil. Select fines for areas that have smoother particles. Select organic/clay for sites with soils that clump in your hand, select vegetated or LWD for sites that are in LWD or are mainly vegetated, not bare ground.

*Canopy-This refers to the amount of vegetation overhead and can really only be accurately measured with specific tools. Generally, select open when there is no vegetation overhead. Select partly open when there is some other vegetation, (besides knotweed), when you look overhead, but you can still easily see the sky. Select mostly closed when there is quite a bit of vegetation overhead, deciduous

trees, etc, but you can still see the sky. Select closed when you look up and only see trees, and shrubs, not sky.

*Plant Erode Potential-This field refers to the likelihood, in the collector's estimation, that the PLANTS (knotweed) can erode from this site. Is it likely that floodwaters will sweep this reach and carry plants downstream? Will ordinary winter water levels cover this area and carry plants downstream? Choose high if plant movement seems certain, medium if movement is likely, low, if it seems unlikely to be moved offsite by water

*High Site Erosion Potential-optional-This field is used to record areas where knotweed removal may temporarily increase the erosion potential of the site itself. This field may be useful to indicate where revegetation may be most appropriate. Answer yes or no.

*Date-Autofills

*Time- Autofills

*Filename-Autofills, but can be typed in as desired. Good to choose date or river name.

IPM PROFILE Japanese Knotweed (Polygonum cuspidatum ~ Fallopia japonica) Giant Knotweed (P. sachalinense ~ F. sachalinensis) Bohemian Knotweed (P. bohemicum ~ F. x bohemica) Himalayan Knotweed (P. polystachum ~ Persicaria wallichii)

July 9, 2004

UPDATED November 2007

Plant Characteristics:
These knotweed species and their hybrids are tall shrublike, perennial herbaceous plants currently listed as Class B Noxious Weeds. There is some dispute about the botanical nomenclature of these four species (Flora of North America North of Mexico Volume 5 2005), but the detrimental effects on the native habitat by all of these species remain unchanged.

The basal root crown will produce 3050 stout bamboolike shoots that may reach to 15 feet tall or more (giant knotweed). The hollow shoots may be an inch or more in diameter with swollen nodes three to five inches apart that are reddishbrown in color. The leaves are produced on upper stems and on the limited side branching. The leaves size and shape vary between species. Japanese knotweed leaves have a truncated base; giant knotweed has huge elephant ear shaped leaves; and Himalayan knotweed has elongate triangularshaped leaves. The smoothedged leaves are green and occur singly at each node in an alternate pattern. Tiny white or greenish flowers appear in open sprays near stem ends during July and August and produce a small winged fruit. The tiny seeds (about one tenth of an inch long) are transported by water, short distances by wind, and in attached mud. The seeds of hybrid knotweeds are considered fertile. The Nature Conservancy has germinated knotweed seeds in the laboratory. Plants arise from fibrous roots and produce a spreading rhizome system, possibly from each major shoot, that may extend to 25 to 40 feet or much more. The rhizomes can penetrate more than seven feet into the soil. Individual plants may be 815 feet in diameter or more, and often occur in large clumps of several hundred square feet to several acres or they can occupy an entire shoreline. The plants die back after a hard frost, but bare brown stalks often remain through the winter. Knotweeds regrow very rapidly in the spring, often reaching 15 feet by June (giant knotweed). Japanese knotweed typically grows to ten feet with the smaller Himalayan knotweed only reaching four to six feet. Himalayan and Japanese knotweeds are known to form a viable hybrid called Bohemian knotweed (P. bohemicum). Growth of the knotweed plants starts in April or earlier in warmer regions, or as late as June in higher elevations. Young knotweed shoots resemble red asparagus. New plants can establish from seeds, broken off stem parts, or from any node along the rhizomes. As little as a half inch plant piece can start a new plant. Pictures are provided on the following website:

http://dnr.metrokc.gov/wlr/lands/weeds/weedid.htm

Distribution and Impacts:
Knotweeds prefer sunny locations, but they can tolerate a wide variety of environmental conditions. They can exist in nearly complete shade with reduced growth. These knotweed species are widespread in western Washington, and occur in almost any environment with at least temporary damp soil to get plants established. They are found in riparian zones along rivers and streams, in disturbed uplands and along crop field edges, in city lots and forest edges, etc. in areas that usually have a fairly high rainfall. Knotweeds are also found in eastern Washington. Currently their distribution is mainly as planted garden ornamentals, but they are also found in limited areas outside of ornamental plantings.

Knotweed is fast growing and extremely aggressive. One small plant can grow up to a foot a week. Huge patches establish fast, invading river and creek banks. In the Pacific Northwest knotweed usually spreads when roots are moved by floods or in soil contaminated with root or shoot fragments. Mowing knotweed can also spread it further. Because root fragments as small as ½ inch can start new plants, even one knotweed patch can produce hundreds of new plants.

Without intervention, knotweed can permanently displace native vegetation, destroy fish and wildlife habitat and reduce recreational opportunities. Initial research indicates that knotweed pulls nitrogen out of our nitrogendeficient soils without returning it with leaf fall (L. Urgenson).This could eventually disrupt the food chain in an aquatic system. Knotweed threatens our current and future salmon populations through loss of insects and shady areas. Knotweed infestations compete for space with trees. Trees not only provide more shade for fish habitats, but also provide better root structure to slow erosion, and decomposing logs produce important nutrients for animals that line in or around the water. Also, trees supply large woody debris which slows water velocity and creates pools, improving habitat for salmon. Knotweeds can also invade manmade structures such as foundations and roads, causing expensive damage.

MANAGEMENT PLANS

Integrated Pest Management, as defined by RCW 17.15, is a coordinated decisionmaking and action process that uses the most appropriate pest control methods and strategy in an environmentally and economically sound manner to meet programmatic pest control objectives.

When following this IPM plan, be sure that siteappropriate control methods are used.

A knotweed control guide Controlling Knotweed in the Pacific Northwest was developed by The Nature Conservancy, Metro, Portland Parks, and the Northwest Chapter of the Society for Ecological Restoration in February 2002. Information from this control guide was used extensively for this initial IPM plan (July 2004).

Many western Washington County Noxious Weed Programs are now involved in large scale knotweed management programs. Much of the control information found in this

IPM Knotweed Profile update (November 2007) was used in the field by the Olympic Knotweed Working Group and reported by the Clallam County Noxious Weed Control Program in 2007.

- When dealing with these riparian infestations, it is imperative to start at the upstream edge of the infestation and work downstream. An infestation along the Hoh River was traced back to a single ornamental planting where broken off plant parts entered the river and established new plants downstream.

Knotweeds continue to be increasingly problematic along riparian corridors in western Washington. These plants are very difficult to control because they have an extensive rhizome system and an incredible ability to resprout. Except for small patches that might be able to be controlled nonchemically, any management of these species will likely require some herbicide use.

It is not considered possible to eradicate these knotweeds species from Washington, but with large scale removal projects and long term monitoring it may be possible to eliminate them from high quality riparian areas, particularly areas where knotweeds may be degrading salmon rearing habitat.

For more information, please contact:

- Clallam County Noxious Weed Control Program 3604172442
- Clark County Noxious Weed Control Board: http://www.co.clark.wa.us/environ/Knotweed.pdf
- Knotweed Alliance: http://www.cabibioscience.org/html/japanese_knotweed_alliance.htm
- WSDA Knotweed Control Program, Marshall Udo, Coordinator http://agr.wa.gov/PlantsInsects/Weeds/Knotweed/Knotweed.htm

CONTROL METHODS Listed below are a range of options, or a combination of options, that may be suitable for site specific control of knotweeds. These control methods are listed in the following order, and include: Prevention, Mechanical, Cultural, Chemical and Biological Controls.

EARLY DETECTION, PREVENTION, FOLLOWUP The knotweeds are very widespread throughout western Washington, and they continue to spread. Learn to identify these knotweed species and remove any new infestations. In eastern Washington it is still an option to prevent these species from becoming widespread, as many of the known sites are mainly ornamental plantings in private yards.

All four knotweed species in this profile are quarantine species, found on the WSDA Prohibited Plant List. It is prohibited to transport, buy, sell, offer for sale or distribute plant parts of the regulated species within the state of Washington, or to sell, offer for sale, or distribute seed packets of the seed, flower seed blends or “wildflower mixes” of these species within the state.

MECHANICAL CONTROL

Mechanical Removal: This technique can be used on single plants and on some larger infestations, but it will be costly to contract suitable equipment. Remove all top vegetation and rhizomes out to at least 50 feet from each plant. It is critical to remove all vegetation including rhizomes and stems, because they will generate new plants from each node if they remain in contact with moist soil. Once this operation is completed, revegetate with appropriate native plants that cast heavy shade on the ground. Plan for at least annual monitoring for new plants from missed plant parts and seed, and treat or remove immediately.

Hand pulling and digging: Hand pulling knotweeds is an option only if the soil is soft, the plants are young, there are only a few plants, and the effort is persistent and ongoing for an extended time period. Once the plants have developed extensive roots and rhizomes they will be nearly impossible to completely remove. Any rhizomes remaining in the soil will produce new plants at each node. Also any knotweed vegetation must be disposed of in such a manner that it cannot take root because even small plant fragments can root if they are in moist soil. In England, compost containing knotweed rhizomes is considered to be an environmental contaminant!

In soft soil or sand, pull up the plant by the root crown, trying to remove as much of the rhizomes as possible. About a week after this effort, search for and pull up any resprouting plants and as much of the rhizome as possible. Search for resprouts at least 20 feet around the location of the original plant. Continue this effort until frost and then start again in the spring. The Nature Conservancy reports that it can take up to three years of consistent effort to eradicate a small patch of plants using this method.

Plants and rhizomes of knotweeds might possibly also be dug out, but this is a slow labor intensive process and probably not practical with anything more than a very small infestation of several plants. Tilling also produces many resprouts but could be used in combination with a hand pulling effort.

> The Four T's If you control knotweed manually, be sure to practice the four T's: be Timely, Tenacious, Tough and Thorough. This advice applies to other noxious weeds with rhizomes. The Nature Conservancy, from "Controlling Knotweed in the Pacific Northwest"

Cutting/Mowing: It is possible to eradicate small patches of knotweed with repeated and persistent cutting of the plants. The patches must be mowed or cut twice a month between April and August and then at monthly intervals until frost. Like pulling/digging this effort will need to be maintained for at least two to three years. Using a hand pruner, lopper, or weed eater, cut the stalks as close to the ground as possible. Do not let the regrowth exceed six inches in height before cutting the stalks to the ground. Stack the cut stalks away from moist ground, where they will dry out and not root. When using a weed eater, ensure that scattered plant parts do not land in moist areas where they can take root.

Covering: There are anecdotal reports of successful control of small patches of plants using a combination of cutting, hand pulling, and/or tilling, followed by covering. After cutting the plants down to ground level, cover the area with several layers of black plastic or several layers of cardboard. Extend the area of coverage to at least 20 feet or more around the outside of the plant and check at intervals to make sure that shoots are not coming up outside of the cover or through the cover. Knotweeds have been known to grow through asphalt! The cover needs to be left in place for at least one full year and probably longer. Inspect the site on a frequent basis to locate new growth or seedlings and remove immediately to maintain major management gains.

CULTURAL CONTROL Burning: Japanese knotweed is not killed, nor even much impacted by burning. However, burning removes dense herbaceous litter and opens access to dense stands for other treatments, such as herbicide application or grazing. Burning should be considered only for stands of one half acre or larger and planned carefully relative to surrounding features and improvements.

Grazing: The Knotweed Alliance Website (http://www.cabi-bioscience.org/html/japanese_knotweed_alliance.htm) indicates that the young shoots of Japanese knotweed are palatable to sheep, goats, cattle and horses and grazing may be used in suitable situations to keep the plant under control. Goats will eat most plants down to stems too woody for ingestion. Grazing will not eradicate Japanese knotweed and the plant will continue to grow once grazing ceases. Grazing may be suitable for quarter acre and larger infestations when the plants have put up enough top growth to support the livestock. Contain the animals on the area by fencing. When all weed growth has been grazed, remove the animals and let the plants develop new shoots. When growth becomes abundant enough to support grazing again, let the animals eat it down a second time. Continue this throughout the growing season and at least through next summer. This may kill some plants and greatly weaken others, as well as, breakup the dense mat of rhizomes extending out from each plant. Under an IPM plan, grazing could be followed, by herbicide application to kill existing re-growth, then revegetation with suitable native plants to create dense shade. Plan on at least annual monitoring for regrowth from seed, rhizomes or broken off stems and treat or remove immediately.

Please contact the Clallam County Noxious Weed Program for information regarding a booklet on goats used for knotweed control.

CHEMICAL CONTROL The following control information was reported in the Olympic Knotweed Working Group 2007 Report, prepared by the Clallam County Noxious Weed Control Program.

The Olympic Knotweed Working Group, covering Clallam and Jefferson Counties, has tried manual control methods and concluded they were ineffective for all but the smallest infestations. The Nature Conservancy was only able to control one small patch (25 stems) with 17 monthly cuttings over three field seasons. Clallam County does not have the

resources to use this method because knotweed is spreading rapidly. The size of existing infestations on many of the rivers is already daunting, and they needed to act quickly before the problem is out of control. Some patches have over 1000 stems, and one site in Clallam County had over two solid acres of knotweed!

- Knotweed has a huge root system with the ability to resprout following cutting. Thus, manually pulling or digging the root system usually leaves behind rhizomes that can resprout in a couple of weeks.
- The herbicides chosen to treat knotweed have been selected for the lowest toxicity possible, as well as for the maximum efficiency to kill the plant.

Several different herbicides are used to remove knotweed. These include:

- Glyphosate, the active ingredient of Roundup. Aqua Neat, AquaMaster, or Glypro are brand names of glyphosate products designed to be less toxic to the environment and labeled for use on rivers, lakes, and streams.
- Imazapyr, in small amounts, may be mixed with glyphosate. Some brand names for imazapyr products used in water are Habitat or Polaris AQ. Imazapyr is similar to glyphosate, has a very low toxicity to most animals, but does remain in the soil longer than glyphosate. Mixing two kinds of herbicides together often improves the effectiveness when compared with using each herbicide individually. Mixing the glyphosate and imazapyr together, reduces the total amount of herbicide used.
- Surfactant, (sometimes called a sticker) is an ingredient that is added to the spray mixture to ensure that the foliage soaks up the herbicide. The Working Group has chosen surfactants that studies have shown to have low toxicity to animals, especially ones that live in water.
- Marker dye, a bluecolored dye called Blazon is mixed into the herbicide spray mix. The dye indicates where herbicide has been applied and minimizes accidental human contact. This dye is not toxic.

General Steps for Knotweed Control:

1. Positively identify your knotweed species.
2. Treat after the canes are four or more feet tall. Treatment is recommended from around MayOctober, or until plants are dying back for the season.
3. Check your site. To use herbicides in or near water, you must be a licensed, aquatic applicator. Most aquatic sites also require a special permit. Contact the Weed Board for help with knotweed control in aquatic sites at 3604172442 or in the west Olympic Peninsula, call 3609632300.
4. It is a violation of Federal law to use herbicides in a manner that is inconsistent with the label. Carefully read all directions for use before applying. Call if you have questions.
5. Post notices that an area has been treated wherever there is public access, such as businesses or parks. With glyphosate and imazapyr, notices can be taken down after 24 hours.
6. Before treatment, protect yourself with nonabsorbent gloves (thin latex works well), eyewear, longsleeved shirt, long pants, and closed toe shoes. The greatest risk generally occurs when mixing or pouring concentrated herbicide. Consider protecting

your mixing site with disposable plastic to catch any spills. Carefully wrap up and dispose of the plastic properly after treatment, or you may wash in the same way as herbicide equipment. See instructions below.

Have water available for mixing or rinsing equipment after treatment.

Treatment: Injection, Foliar, Wipe. See below for specific application instructions.

Document your treatments, to know how much you had, what you did, and how well the treatment worked. Monitor treated areas for several years. Retreat as needed. Don't let plants come back!

2007 Treatment Recommendations and Rates Summary:

For small patches (less than 2300 canes) with large diameter canes: Inject 35 ml of undiluted glyphosate. If using AquaNeatdo not use more than 7 ½ quarts/acre. Be sure to check the acreage limit for the specific product you are using.

For treatment of large patches (or if foliar application is desired): Spray foliage until wet using a solution of one of the following:

6%8% solution of glyphosate (For AquaNeat this equals 7 oz. 10 ¼ fl. oz per gallon water), PLUS ½ % to 2% surfactant, (Use the specific label to determine how many ounces per gallon must be added to equal this percentage. Many nonaquatic formulations of glyphosate already contain some surfactant), PLUS marker dye, (Blazon Blue for aquatic sites, many others available for terrestrial) as needed (just enough to make it blue, as little as ½ fl oz. per gallon of water).

OR 3%5% glyphosate, PLUS ½ to 1% imazapyr (For Habitat this equals 0.6 oz1.3 fl oz per gallon water), PLUS ½ % to 2% of surfactant, (See aboveUse the specific label to determine how many ounces per gallon) PLUS marker dye as needed, (just enough to make it blue, as little as ½ oz. per gallon of water).

For ReTreatments: Several Options and Recommendations

INJECT at highest allowed rate, if cane diameter is large enough

Foliar treat at the higher rate. Plants may have been missed the previous season. For those showing herbicide symptoms, use the combination of glyphosate (AquaNeat) and imazapyr (Polaris AQ or Habitat), at the higher rates mentioned above, with higher rates of surfactant.

For small plants, wipe with 33% solution of glyphosate (mix one part of AquaNeat product with 2 parts water) plus 10% by volume of surfactant (12 oz per gallon). Add enough marker dye to make it blue.

NOTE: Some programs have used Rodeo successfully. Ask your weed control specialist for the latest information about rates and efficacy. Improper disposal of knotweed canes or roots often leads to new infestations. Never throw untreated knotweed plants or parts into the water. Burn canes and roots or allow knotweed debris to dry thoroughly in a location that can be monitored frequently to ensure that no resprouting occurs.

INJECTION TREATMENT

- Measure the area of the infestation accurately. Ask your weed control specialist for the latest information about rates and efficacy. Improper disposal of knotweed canes or roots often leads to new infestations. Never throw untreated knotweed plants or parts into the water. Burn canes and roots or allow knotweed debris to dry thoroughly in a location that can be monitored frequently to ensure that no resprouting occurs.
- Post an herbicide notice if it is required. Remove after 24 hours.
- Write down the amount of herbicide in the container before you pour any out; this makes it easy to know how much has been used by the end of the treatment.
- Put on personal protection equipment, including gloves and eyeprotection. Wear longsleeved shirt, pants, and closedtoe shoes.
- Assemble the injector tool. To attach the needle, pull back the quick release ring on the gun. Attach the needle, with the hole pointing down. Be sure the quick release ring snaps fully into place or the needle will come loose. Before attaching the canister to the top of the injector gun, inspect the threads for any debris. Rinse or clear anything in the threads. Do not tighten down the canister too hard, or you will crack the body of the injector and it will leak or fail to pressurize.
- Pour undiluted glyphosate into the injector canister. Try to measure out only the amount you plan to immediately use for treatment and no more. Close the lid to the herbicide container as soon as you have finished pouring. ALWAYS AVOID POURING HERBICIDE BACK INTO THE ORIGINAL CONTAINER.
- Calibrate, using the small plastic, measuring tube provided in the kit. It takes a couple of squirts to build up pressure. Make sure the tool is not delivering more than 5 ml. Turn the set screw in the handle (using the allen wrench provided in the kit) to adjust flow. Outreduces flow, inincreases flow. After adjusting, recheck calibration. After you are satisfied, pour the herbicide generated from calibration into the injector's canister. Calibrate every time you fill the canister again.

Injection Application: Use on patches less than 14002000 canes, depending on the label and application rate. Canes need to be about ¼ inch diameter or larger (about the size of a little finger). Smaller canes will likely need to be sprayed or wiped with a concentrated mixture (see Wipe below). Only glyphosate is registered for injection.

Herbicide: Use concentrated glyphosate only, no surfactant, or dye. Glyphosate is a nonselective herbicide that can injure other desirable plants, so be careful not to drip or rinse onto nontargeted plants. Check the label for maximum rates. Generally, YOU MAY NOT USE MORE THAN 71/2 8 quarts of glyphosate/acre. Do not exceed the maximum rate allowed on the label!

Equipment: Each injector kit contains: a numbered injector gun, an herbicide canister, a capped measuring tube with a long and a short needle inside, and an allen wrench. Marking paint and a garbage sack are optional, but suggested.

Directions for Injection Treatment:

- Inject 35 mls of undiluted glyphosate into the middle of the lowest node of each suitable cane. Short needles seem to work best, long ones tend to bend or break, but

may be best when the plant is full of water. If you feel too much back pressure, poke a couple of holes higher up in the node to let out the pressure. Try slanting the needle down for canes that are smallish for this method. Older canes can be brittle and may crack when injected. Consider marking treated canes as you go. This will avoid “skips”. We use a small dot of spray paint. Rinse all equipment that may be contaminated with herbicide three times (triple rinse). There will be a cleaning fee charged for any loaned equipment that is returned without adequate cleaning.

Dispose of rinsate on undesirable plants onsite.

Repack injector kit and return promptly along with any unused herbicide.

Fill out knotweed control sheet and turn in with equipment. Let us know of any equipment problems.

Don’t cut or disturb stems for at least a week to ten days after an application.

Wash before eating or drinking and after treatment.

Wash clothes that may have been contaminated by herbicide separately from other laundry.

FOLIAR TREATMENT

- Foliar Application: Use on large patches, small diameter plants, or simply as desired. Several treatments will be necessary, but each treatment is generally faster and uses less herbicide than injection. Foliar applications can be used in conjunction with injection. When combining treatment methods, inject first, follow with spot foliar treatment. Consider shielding desirable plants.
- Herbicide: Many products are available but we are currently using glyphosate, (or a mix of glyphosate and imazapyr), surfactant, and marker dye.
- Equipment: Handheld backpack sprayer, (holds up to 4 gallons), measuring cup.

Directions for Foliar Application:

- Measure the area of infestation to determine how many gallons of spray to mix. A gallon of spray solution should treat approximately 1000 square feet, depending on plant size and infestation density.
- Note any vegetation or areas that you may want to protect from drift. Ask about techniques, such as waxed cardboard shields, that might help in your situation.
- Write down the amount of herbicide in the container just before you start; this makes it easy to know how much has been used by the end of the treatment.
- Put on personal protection equipment, including gloves and eyeprotection. Wear longsleeved shirt and pants, and closedtoe shoes. Consider wearing a hat to protect against potential drift or drips.
- Protect mixing site from possible spills by laying plastic under mixing area.
- Fill sprayer to approximately half the amount of herbicide spray you want to mix (4 gallons maximum). Leave the strainer at the top to keep things from falling in. You may have to put the lid on and pump up the sprayer to detect problems. Check to see that the sprayer is not leaking out the bottom, that the handle shuts off appropriately, and that the nozzle tip is not clogged. Fix any problems before adding herbicide or other ingredients, or get another sprayer.

• Measure herbicide according to how many gallons you want to mix (4 gallons maximum) then pour into sprayer. Replace the lid on the herbicide container as soon as you have finished pouring. Try to mix only the amount of herbicide solution you will need to use and no more. Next, add surfactant, if required. Finally, add a small amount of marker dye, if desired. ALWAYS AVOID POURING HERBICIDE BACK INTO THE ORIGINAL CONTAINER.
• Rinse measuring cup and empty into sprayer several times; finish filling sprayer with water. Avoid overfilling or the mixture may slosh out the vent hole in top. NOTE: Marker dye gets on EVERYTHING! The blue will wash out of clothes, but takes a while to fade from skin or shoes. The dye is nontoxic, and its presence does NOT necessarily mean you have been contaminated with herbicide! A good trick is to rinse the pack, especially the lid, and the dye container, until you don't see any more blue.
• Attach and tighten the sprayer lid, gently shake the sprayer side to side to mix solution.
• Put on pack, but avoid bending over with full pack because of potential sloshing and spillage.
• Pump up pressure with handle on the left side. Do not over pressurize.
• Apply herbicide to all the leaves as uniformly as possible, just until they are wet. Knotweed plants can be very tall. Position yourself so you are not underneath a spray stream. For a very large site, it is sometimes necessary to ring the infestation, and return after those initial plants have died back, moving inward with each treatment. Or, cut a path into the interior and spray on either side and back out as you go. Or, cut plants in May or June and return in August and September to treat the regrowth. You will have to determine what works best for each individual site.
• Rinse all equipment that may be contaminated with herbicide three times (triple rinse). There will be a cleaning fee charged for any loaned equipment that is returned without adequate cleaning.
• Dispose of rinsate on undesirable plants onsite.
• Return equipment promptly along with any unused herbicide.
• Fill out knotweed control sheet and turn in with equipment. Let us know of any equipment problems.
• Don't cut or remove stems for at least a week to ten days after an application.
• Wash before eating or drinking and after treatment.
• Wash clothes that may have been contaminated by herbicide separately from other laundry.

WIPE METHOD TREATMENT

- Wipe Application: For small patches, small plants, or areas requiring very selective treatment. In 2007 we are recommending wipe as a trial treatment on previously treated plants, that are small, but showing signs of herbicide damage.
- Herbicide: Many herbicide products are available but we are currently using glyphosate, (or a mix of glyphosate and imazapyr), surfactant, and marker dye. Dilute from concentrated product.
- Equipment: Foam brush, containeradditional container carrier and loppers to cut canes before wiping are optional.

Directions for Wipe Application:

- Write down the amount of herbicide in the container just before you start; this makes it easy to know how much has been used by the end of the treatment.
- Estimate the amount of solution needed.
- Put on personal protection equipment, including gloves and eyeprotection. Wear longsleeved shirt and pants, and closedtoe shoes.
- Protect mixing site from possible spills by laying plastic under mixing area.
- Measure One part full strength AquaNeat into container, add two parts water. The goal is to mix a 33% solution. Be sure to leave room in the container for surfactant. Add up to 10% surfactant.
- Close bottle tightly, shake to mix. Replace the lid to the herbicide container as soon as you have finished pouring. Try to mix only the amount of herbicide solution you will need to use. Finally, add a small amount of marker dye, if desired. Try to measure out only the amount you plan to immediately use for treatment and no more.

ALWAYS AVOID POURING HERBICIDE BACK INTO THE ORIGINAL CONTAINER.

- NOTE: Marker dye gets on EVERYTHING! The blue will wash out of clothes, but takes a while to fade from skin or shoes. The dye is nontoxic, and its presence does NOT necessarily mean you have been contaminated with herbicide! Rinse the dye container, especially the lid, until you don't see any more blue.
- Consider placing container into a small bucket with a handle to prevent container from spilling, and to hold the foam brush between applications. Or, consider placing brush in an extra glove between uses. This is especially useful if you have to travel any distance.
- Dip brush into solutionFor large caneslop to a three foot height, and paint all sides of the stem thoroughly. Stack the portion that is removed where it will dry out and not be allowed to root. For small plants, paint as much of the exposed surface as possible.
- Rinse all equipment that may be contaminated with herbicide three times (triple rinse). Foam brushes should rinsed, then deposit along with used gloves in a garbage bag. There will be a cleaning fee charged for any loaned equipment that is returned without adequate cleaning.
- Dispose of rinsate on undesirable plants onsite.
- Return equipment promptly along with any unused herbicide.
- Fill out knotweed control sheet and turn in with equipment. Let us know of any equipment problems.
- Don't cut or remove stems for at least a week to ten days after an application.
- Wash before eating or drinking and after treatment.
- Wash clothes that may have been contaminated by herbicide separately from other laundry.

The following information was reported for the original IPM Knotweed Profile 2004

Herbicide Treatment:
Glyphosate (Rodeo® and other glyphosate brands with aquatic labels) has been used to effectively control Japanese knotweed in aquatic situations. Glyphosate is not selective and will damage most other plant species. When desirable vegetation is nearby, applicators should try to minimize its loss by focusing their application just on the target plants.

Foliar application, using backpack sprayers or similar methods, is more efficient on larger monoculture stands of more than a few plants to several acres in size. To achieve the best chance of complete kill, apply herbicide in the spring to plants that are less than 4 feet. The plants need to be large enough to ensure that there is adequate leaf surface. Spray to wet and try to avoid dripping of the herbicide from the leaves. Larger plants will not be killed with just one herbicide application and killing these plants with foliar application may take several applications over several growing seasons. Although the late bud stage of growth is considered to be the most effective time for herbicide application for knotweed species, waiting that long also means dealing with a huge plant.

Cut stem application can result in up to 95 percent mortality according to the Clark County Noxious Weed Control Board. In the summer or fall, cut each stem within one to three joints of their base (internodes). Add herbicide into the exposed hollow stem cavity following label recommendations. Cut stem application is laborintensive, both to cut each stem and to apply herbicide, but it will assure that the herbicide is only applied to target weeds and not to other desirable vegetation. It has also been shown to be an effective way to kill this extremely persistent weed. Dispose of the cut stems away from moist environments where they might take root.

Stem injection of Japanese knotweed for some formulations of glyphosate has been approved for the 2004 growing season. Two holes are made through the first or second node of each stem using an ice picklike probe to penetrate each cane. A syringe, or commercial injection gun can be used to deliver a metered dose of herbicide to the stem through one of the holes. Having a second hole, allows any liquid in the stem to escape as the glyphosate is injected. The Clark County Weed Control Board reports that the plant takes up the herbicide within 20 minutes of injection. They also report that each stem appears to be supported by a separate rhizome. This means that to kill the entire plant, each stem must be injected! For large plants, the Weed Board suggests injecting the outer most stems, coming back later to remove the dead stems and then injecting the remaining stems. Although, like the cut stem method, this is labor intensive, 100 percent kill has been reported. It also ensures selective control of just the target species.

An aquatic labeled formulation of triclopyr has been approved for use in Washington in 2004. The Nature Conservancy reports that triclopyr will control Japanese knotweed, but there are no specific control recommendations for Japanese knotweed on the Renovate® label. Controlling Knotweed in the Pacific Northwest advises that for successful translocation to occur, some herbicides should be used at the lowest effective

concentration in order to avoid damaging the above ground tissues of the plant before the herbicide is well dispersed in the root system. This guide indicated that triclopyr (Garlon 3a) at five percent solution appeared to give good topkill on Japanese knotweed but resulted in mediocre longterm control on large patches. However, there are reports of successful control using triclopyr at rates as low as ¾ percent in high volume application. In Nature Conservancy field experiments, a 35 percent triclopyr application (Garlon 3a) eradicated about 50% of small patches after two treatments. In controlled experiments comparing treatments on small patches (30200 stems), triclopyr (Garlon 3a) provided 90+ percent control in one year and 100 percent control within 2 years. Renovate® is the aquatic labeled formulation of Garlon 3a and presumably should provide similar results.

BIOLOGICAL CONTROL In their native range, Japanese and giant knotweeds are impacted by a large number of natural enemies that are absent in North America. If proven to be host specific, these natural enemies could be used as biological control agents. Biological control can be a highly cost effective and sustainable means of controlling widespread weeds. However, it requires extensive surveys in the native range and rigorous testing of candidate biocontrol agents to make sure that they will not feed on nontarget plants.

Research toward the development of a biological control program for knotweed is well underway. Much of the initial research has already been carried out for a biological control program against Japanese knotweed in the United Kingdom. The U.S. Forest Service has sponsored additional surveys and initial testing of promising natural enemies for a North American program. In 2007, two insects were imported into a quarantine facility for host range testing. These include a leafchewing chrysomelid beetle, Gallerucida bifasciata, and a sapsucking psyllid, Aphalara itadori. With additional funding, the required research could be completed within two years. (Information provided by Fritzi Grevstad, Weed Biocontrol Program, Olympic Natural Resources Center, University of Washington, 2007).

Appenidx C

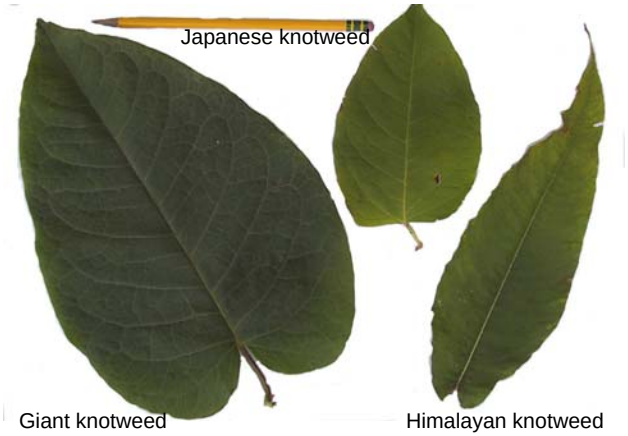
What is knotweed?

Japanese, Giant, Bohemian, and Himalayan knotweed are perennial plants native to Asia, but planted in gardens here. Common names include Mexican or Japanese bamboo, elephant ear and fleeceflower. By any name, they are noxious weeds and a critical threat to the health of our rivers.

Scientific names include:
Polygonum cuspidatum, P. sachalinese, P. bohemicum, and P. polystachyum.

Why is knotweed a problem?

Knotweed is fast growing and extremely aggressive. It invades river and creek banks, permanently displaces native vegetation, destroys critical fish and wildlife habitat and reduces recreational opportunities. It can invade man-made structures such as foundations and roads, causing expensive damage. Due to a huge and vigorous root system, large patches are very difficult to eradicate. Seasonal flooding continues to spread knotweed throughout many Northwest watersheds. Numerous patches can be found throughout the Peninsula, as well as adjacent areas of the state.



What does it look like?

- Dense stands up to 12 feet tall
- Bamboo-like green or reddish stems
- Bright green leaves 1 to 12 inches wide with smooth (not saw-toothed) edges
- Starts growing in April; full sized by July
- Spikes of small, white flowers in late summer
- Dormant in winter, the dead, brown stems may remain standing

Where does it grow?

Knotweed thrives in any moist soil or river cobble, in full or partial sunlight. Most common in the flood plains along rivers and creeks, it also grows in roadside ditches, waste areas and beaches.

How does it spread?

In the Pacific Northwest, knotweed usually spreads when roots are moved by floods or in contaminated soil. Because root fragments as small as ½ inch can start new plants, even one patch can produce hundreds of new plants.

What is being done?

Concerned citizens, weed boards, tribes, watershed councils, conservation organizations, and public agencies are teaming up to control knotweed in many watersheds.

Information Resources

These internet sites provide information about knotweed and other invasive species:

- www.clallam.net/weed/
- www.tncweeds.ucdavis.edu/esadocs/Polycusp.html
- www.ecy.wa.gov/programs/wq/plants/weeds/aqua015.html

Knotweed is an aggressive and destructive weed that spreads quickly, shades out native plants and destroys habitat. We need to act now! Within a few years it will be virtually impossible to control knotweed.

WHAT CAN I DO?

- **Check Your Property.** If you have knotweed, control it using the methods described here.
- **Call Us!-**We are mobilizing efforts to control knotweed in a watershed near you. **Our highest priority is controlling knotweed near waterways or in flood zones.** For help or detailed control information, contact one of the groups listed on the back of this brochure.
- **Avoid Spreading Knotweed.** Be careful working around it as small fragments can get into machinery, dirt piles or the river and be moved to other areas.
- **Volunteer** with your local control program. It is only by working together that we can stop the spread of this noxious weed.

HOW CAN IT BE CONTROLLED?

Several treatments options are described here. Because of knotweed's tremendous ability to resprout following cutting, successful control usually requires herbicides. Please check with your local extension agent, weed board or the Department of Agriculture for information about the proper, safe and legal use of herbicides.

- **SPRAY HERBICIDE** containing glyphosate (e.g. Rodeo, Aquamaster, Roundup, Gly Star) on the leaves and stems in summer or early fall. To avoid spraying very tall plants, it is possible to cut the stems once in May or June and allow the plant to regrow to at least waist height. Most patches require more than one year of treatment.
- **NON-SPRAY HERBICIDE METHODS** include injecting undiluted herbicide directly into the lower sections of every stem or applying slightly diluted herbicide directly onto stems. Some limitations, as indicated on the label, apply.

Always read and follow directions on the product label and keep herbicides out of waterways. Desirable plants hit with spray will be injured or killed.

- **MANUALLY PULL or DIG very small, poorly established** infestations, removing all the roots of plants in loose soil. Check often for new sprouts and repeat. Or, CUT the stems close to the ground every two weeks throughout the growing season. Both methods will require several years of persistent treatment for successful control.

Cut stems or root fragments left on moist soil, in the river or in compost will regrow. Please carefully dispose of all knotweed material.

Appenidx C

We Can Help!

If you have questions about knotweed control, have knotweed on your property and want assistance, aren't sure if you have knotweed, or would like to volunteer, please contact us:

Cathy Lucero
Clallam County Noxious Weed Control
223 E. Fourth St. Suite 15
Port Angeles, WA 98362
(360) 417-2442
clucero@co.clallam.wa.us
For **West Olympic Peninsula** call-360-963-2300

Eve Dixon
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Service is currently funded by grants from Washington State Department of Agriculture, United States Department of Agriculture, National Forest Service, the North Olympic Community Salmon Fund, and the Clallam County Noxious Weed Control Board. Projects are limited to certain priority areas and are based on funding availability.

This is a modified version of a brochure produced by **The Nature Conservancy** in collaboration with multiple partners. Photo of leaf comparisons was provided by **Laurel Shiner** and additional photos were provided by **Olympic Knotweed Working Group**

KNOTWEED

Without prompt and vigorous action, knotweed destroys native habitat, takes over entire riverbanks, and damages recreational quality of Northwest rivers.

Help save our lands and our rivers from this destroyer of watersheds

Frequently Asked Questions for Landowners with Knotweed

What does knotweed look like?

- Bamboo-like green or reddish stems
- Bright green leaves 1 to 12 inches wide with smooth (not saw-toothed) edges
- Starts growing in April; full sized by July
- Spikes of small, white flowers in late summer
- Dormant in winter, the dead, brown stems may remain standing
- Dense patches can grow up to 12 feet tall

Where does it grow?

Knotweed thrives in any moist soil or river cobble, in full or partial sunlight. It is most common in the flood plains along rivers and creeks. It also grows in roadside ditches, waste areas and beaches.

How does it spread?

In the Pacific Northwest, knotweed usually spreads when roots are moved by floods or in soil. Mowing knotweed can also spread it further. Because root fragments as small as ½ inch can start new plants, even one patch can produce hundreds of new plants.

Why are you getting rid of this weed? Why is it so harmful?

- Knotweed is fast growing and extremely aggressive. One small plant can grow up to a foot a week! Huge patches can grow fast, invading river and creek banks.
- Knotweed eventually keeps any plants from growing underneath, and animals and fish don't use it for food or shelter.
- It permanently displaces native vegetation, destroys fish and wildlife habitat and reduces recreational opportunities.
- Knotweed pulls nitrogen out of our nitrogen-deficient soil without returning it. This creates an imbalance in the food chain.
- Knotweed threatens our current and future salmon population through loss of insect populations and shady areas.
- Knotweed infestations compete for space with trees. Trees not only provide more shade for fish habitat, but also provide better root diversity to protect from erosion, and decomposing tree parts produce important nutrients for animals that live in or around the water. Also, trees supply Large Woody Debris which slows water velocity and creates pools, improving habitat for salmon.
- Knotweed can invade man-made structures such as foundations and roads, causing expensive damage.

Why is the County using herbicides to control knotweed?

- Clallam County and other organizations have tried manual control methods and concluded they were ineffective for all but the smallest infestations. The Nature Conservancy was only able to control one small patch (25 stems) with 17 monthly cuttings over three field seasons. Clallam County does not have the resources to use this method because of how rapidly knotweed is spreading. The size of existing infestations on many of our rivers is already daunting, and we need to act quickly before the problem is totally out of control. Some patches have over 1000 stems, and we have seen over 2 solid acres of knotweed in Clallam County!

- Knotweed has a huge root system and the ability to resprout following cutting. Thus, manually pulling or digging the roots out usually leaves behind leftover roots that can grow back in a couple of weeks.
- The herbicides chosen to treat knotweed have been selected for the lowest toxicity possible, as well as for the maximum efficiency to eradicate the plant.

What herbicides are you using to kill them with?

The herbicides being used are low toxicity herbicides.

- **Aqua Neat, AquaMaster,** and **Glypro**- We are using glyphosate, which is the active ingredient of Roundup. However, **Aqua Neat, AquaMaster, or Glypro** are designed to be less toxic to the environment and are labeled for use on rivers, lakes, and streams. We may use an additional herbicide called **imazaypr** (the product name is Habitat) if we find sites that will not respond to glyphosate. Imazaypr is similar to glyphosate, has an even lower toxicity to most animals than glyphosate, but does remain in the soil longer. By mixing the two together, we can reduce the amount used overall. Mixing two kinds of herbicides together often improves the effectiveness when compared with using each herbicide individually.
- **Agridex-** Agridex is the surfactant that is added to the spray mixture to ensure that the foliage soaks up the herbicide.
- **Blazon**- A blue color indicator is mixed into the herbicide we are spraying. This marks where we have sprayed to minimize human contact. This additive is non toxic.

What are your methods for treatment?

- First, we survey the river by boat to record where current knotweed infestations are located.
- Then, we ensure that all landowners who have knotweed on or bordering their property are contacted about treatment.
- Where practical, the herbicide is injected into the plant stem, thereby minimizing impacts to other plants or wildlife.
- Sometimes, the herbicide is sprayed on the leaves and stems. The herbicide dries and absorbs quickly, thereby minimizing possible exposure.
- After treatment, visible effects on the weed occur within 2-7 days and include wilting and yellowing of the plant. This advances to complete browning of above-ground plant matter and destruction of underground plant parts.
- All pesticide spray records are kept on file for seven years.
- Knotweed control requires follow-up monitoring for several seasons and may entail additional spot treatments.

Knotweed Injection Equipment

Can I just use Roundup and do it myself?

- Yes, as long as the plants are not near water. The use of herbicides in water is restricted in Washington State. Only a licensed, aquatic applicator or employees working under the supervision of a certified applicator may acquire the permits necessary to apply into water. Additionally, certified applicators are trained professionals who can ensure optimal treatment so knotweed does not grow back.
- Although glyphosate is a low toxicity pesticide and no more than slightly irritating based on toxicity studies; you should always be sure to wear proper protective equipment. Ask about the latest information to best control knotweed.
- The service is currently funded by grants from Washington State Department of Agriculture, United States Department of Agriculture, National Forest Service, the North Olympic Community Salmon Fund, and the Clallam County Noxious Weed Control Board. Projects are limited to certain priority areas and are based on funding availability.

What happens when the herbicide gets into the river? Does it hurt the fish?

Glyphosate has slight to moderate toxic effects on aquatic organisms, and it is virtually non toxic to birds, bees, and earthworms. Fortunately, the herbicide binds so well to soil that the chance of it running off or leaching into the river is minimal. In addition, it does not readily stay in water due to its ability to bind to soil. Studies have shown that any residues that could accumulate in fish would disappear quite rapidly. When applying herbicide

in aquatic environments, the concern is mostly with leaving decomposing plants that soak up oxygen in the water, thereby killing fish. No knotweed treatments are expected to leave such a large amount of decaying plant matter, so this should not be a problem. In fact, with effective and safe herbicide application, we are hoping to increase fish habitat that vanished due to overgrown knotweed patches. Many knotweed projects have seen native plants readily returning to previously infested sites.

What are the environmental impacts using this herbicide?

Under recommended use, glyphosate binds tightly to soil particles and is no longer available for plant uptake. Soil adsorption prevents the herbicide from leaching into groundwater supplies. However, please notify us if you are aware of water from the river being used by landowners in any way. Potable water intakes from the river must be turned off within 48 hours of the application.

If used according to the label, it will not harm off-site vegetation where other roots grow into the treatment area. Some spray treatments, usually done before or after rain events, may have slight detrimental affects to nearby plants, making them look stunted. Overall, the benefits of eradicating knotweed infestations outweigh any minor plant damage that may occur. It also creates additional area for new plants to emerge.

What does it mean to sign the PERMISSION TO ENTER PRIVATE LAND AND WAIVER OF LIABILITY?

- You are granting permission for activities related to knotweed control.
- Although the agreement indicates a time period from April 1, 2008, to October 31, 2013, you may revoke the agreement at any time.
- The WSU, WSDA, and County, are not responsible for any injury, damage, or harm, resulting from knotweed control.
- The landowner is not responsible for any injuries of WSU, WSDA, or County employees or their agents while they are controlling knotweed on your property.
- Through WSDA licensing, individual applicators are responsible for any adverse effects resulting from their treatment.
- Both parties are agreeing that each party shall be held liable for their own actions or omissions.
- All landowners should completely read and understand the contract before signing.

Why aren't you going after other weeds too?

In some places, we may also remove Scotch broom. If we see other noxious weeds while treating for knotweed, we will attempt to record those locations for possible future treatment using the most effective method for that particular weed. Generally, noxious weed control is the responsibility of the landowner. Because of the complexity of treating noxious weeds near water, it is difficult for landowners to handle knotweed problems. Current grant funding allows us to help, but dictates the scope of current herbicide treatments.

Why are you just treating by rivers?

Due to funding and resource limitations, we are focusing our efforts on rivers because they are the most sensitive to knotweed invasions. Through this strategy, we hope to make the biggest impact with available funding.

If I have animals on my property, will they get sick?

The products we are applying are considered relatively non toxic to dogs and other domestic animals. However, it is always a good idea to keep pets away from the treatment area until the product has dried. Ingestion of this product or large amounts of freshly sprayed knotweed may result in temporary gastrointestinal irritation. If such symptoms are observed, provide the animal with plenty of fluids to prevent dehydration. Call a veterinarian if symptoms persist for more than 24 hours.

If it's been around so long why are you just getting around to doing something now?

Knotweed is currently taking hold of Clallam County's streams and rivers. Control efforts have been underway in some areas for the last three years, and money has just become available for more treatment. This year's Westside projects include treating the Big River, the Sol Duc River, the Hoko River, the Sekiu River and the Pysht River. There is also an effort to control knotweed on the East Dickey, downstream to La Push, and in the lower 29 miles of the Hoh River. Other projects include the Elwha River, Valley Creek, the Dungeness River and several east Jefferson County rivers.

Before Treatment

After Treatment

Why aren't you spraying like the trucks I see driving on the side of the road? Are you the people spraying along the road?

No. The County does not currently spray herbicides on any County-owned rights-of-way. The Department of Transportation as well as local City governments are responsible for controlling weeds on many roadsides and have different policies for vegetation management.

What do I do if I have a water intake from the river?

After herbicide treatment of knotweed, water quality results have shown negligible amounts of any harmful chemicals, significantly below even drinking water standards. On the label, there are no restrictions for accidental overspray of knotweed plants on river banks. If you do have a water intake, please inform Clallam County so extra care can be taken when treating upstream of your property.

Are there alternatives to using herbicides on my property?

Digging

You may manually pull or dig **small**, **poorly established** infestations, removing all the roots of plants in loose soil. Digging knotweed does not work unless it is a brand new plant; you have to get every bit of the root and the roots can grow to be 30 feet long! Once knotweed becomes established, there is unanimous agreement that removal via digging is not recommended. Digging will only spread rhizome fragments, which in turn grow into new plants.

Cutting

Cutting removes less of the plant than digging and is less effective. It may actually increase stem density even when repeated frequently. If you use this method, please destroy properly! Tossing the canes in a rubbish pile or even worse, into the river, will just spread knotweed further.

Biological/Cultural

Biological controls are not yet available for knotweed. There are also no known native species or desirable non-native species that can out-compete knotweed once it is established.

I don't feel comfortable having County employees on my property.

Noxious weed crews' sole purpose is to treat knotweed and not to look for other problems on your property. If you feel uncomfortable, we welcome and encourage you to supervise the crew as they are treating knotweed. If you are unhappy with the behavior of any County employee, please contact us at 360-417-2442 as soon as possible so that we may address your concerns.

PERMISSION TO ENTER PRIVATE LAND AND WAIVER OF LIABILITY

THIS AGREEMENT INCLUDES PERMISSION TO ENTER PRIVATE PROPERTY AND A WAIVER OF CERTAIN CLAIMS OF LIABILITY. READ CAREFULLY BEFORE SIGNING.

This Permission to Enter Private Land and Waiver of Liability is made between the Clallam County Noxious Weed Control Board, hereafter referred to as "the Board," and _____, hereafter referred to individually or collectively as "the property owner(s)."

INTRODUCTION

1. The control and eradication of noxious weeds on public and private lands is in the public interest and the presence of knotweed (*Polygonum* spp.) on private lands threatens wildlife habitat and provides a source for renewed infestation of public lands. Effective eradication of knotweed requires concerted efforts on both public and private lands to protect public resources.

2. The Board and its agents desire to perform activities to eradicate and/or control knotweed on public and private lands within Clallam County. These activities are authorized and carried out under one or more of the following chapters: 17.04 RCW, 17.06 RCW, 17.10 RCW, 17.24 RCW.

3. The property owner(s) is/are the sole owner(s) of property located at _____ in Clallam County, Washington, hereafter referred to as "the property."

4. The property owner(s) is/are interested in and benefited by the eradication and/or control of knotweed on the property.

5. The property owner(s) and the Board desire to memorialize an agreement for the purpose of eradication and/or control of knotweed on the property.

AGREEMENT

1. **Permission.** In consideration of the benefits described above, the property owner(s) grant permission to the Board and its agents, contractors, cooperators and employees to enter onto the property, with at least twenty-four (24) hours notice, from April 1, 2008, to October 31, 2012, to perform activities to eradicate and/or control knotweed on the property. The property owner(s) acknowledge and agree that these activities may include the application of herbicide to the property.

   The property owner(s) also grant permission to agents, contractors, cooperators and employees of the Washington State University and/or the Washington State Department of Agriculture to enter onto the property, with at least twenty-four (24) hours notice, from May 11, 2008, through October 31, 2012, for the purpose of monitoring and evaluating the success of knotweed eradication and/or control activities.

2. **Expiration and Revocation.** The Board and its agents, contractors, cooperators and employees are permitted to enter the property on all of the above dates and until October 31, 2012, or until this permission is revoked, whichever occurs first. The property owner(s) may revoke this permission by presenting a written letter of revocation to the Board. The revocation is effective five (5) business days after receipt by the Board.

3. **Liability Waiver.** The property owner(s) expressly agree to hold harmless the Board, the Washington State University (WSU), the Washington Department of Agriculture (WSDA), and the agents, contractors, cooperators and employees of the Board, WSU, or WSDA, and to waive any claim of liability against the Board, WSU, WSDA, and the agents, contractors, cooperators and employees of the Board, WSU, or WSDA, for any injury, damage, or harm which may result from entry onto the property under this agreement or from activities to eradicate and/or control knotweed on the property, including but not limited to, the application of herbicide upon the property. As to any other act or omission of either party under this agreement, each party shall be responsible for its own acts or omissions and those of its officers, employees and agents under this agreement. No party to this agreement shall be responsible to the other for the acts or omissions of entities or individuals not a party to this agreement.

4. **Entire Agreement.** This Permission to Enter Private Land and Waiver of Liability contains the entire agreement between the parties with regard to the matters set forth herein.

5. **Applicable Law.** This Permission to Enter Private Land and Waiver of Liability shall be construed and interpreted according to the laws of the State of Washington.

BY THE SIGNATURE BELOW, THE PROPERTY OWNER(S) DECLARE THAT THE TERMS OF THIS PERMISSION TO ENTER PRIVATE LAND AND WAIVER OF LIABILITY HAVE BEEN COMPLETELY READ AND FULLY UNDERSTOOD AND VOLUNTARILY ACCEPTED AND EXPRESSLY WAIVE ANY CLAIM THAT THIS PERMISSION TO ENTER PRIVATE LAND AND WAIVER OF LIABILITY IS NOT FAIRLY AND KNOWINGLY MADE.

Property Owner(s) Phone Number: _____

Property Owner(s) Address: _____
Street

_____
City **County** **Zip**

Name of property owner	**Signature of property owner**	**Date**
Name of property owner	**Signature of property owner**	**Date**
Name of property owner	**Signature of property owner**	**Date**
Name of authorized representative, Clallam County Noxious Weed Control Board	**Signature of authorized representative, Clallam County Noxious Weed Control Board**	**Date**

Contact information for the Clallam County Noxious Weed Control Board: **Cathy Lucero, (360) 417-2442**

223 E. 4th, Suite 15 Port Angeles, WA 98362